



## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

WILLIAMSON, Matthew M. et al.

U.S. Patent Application No. 10/629,844

Group Art Unit: 2681

Filed: July 30, 2003

Examiner: Unassigned

For: ALLOCATION OF COMMUNICATIONS FREQUENCY SPECTRUM

**TRANSMITTAL OF CERTIFIED PRIORITY DOCUMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

At the time the above application was filed, priority was claimed based on the following application:

*British Application No. 0217829.1, filed July 31, 2002.*

A copy of the priority application is enclosed.

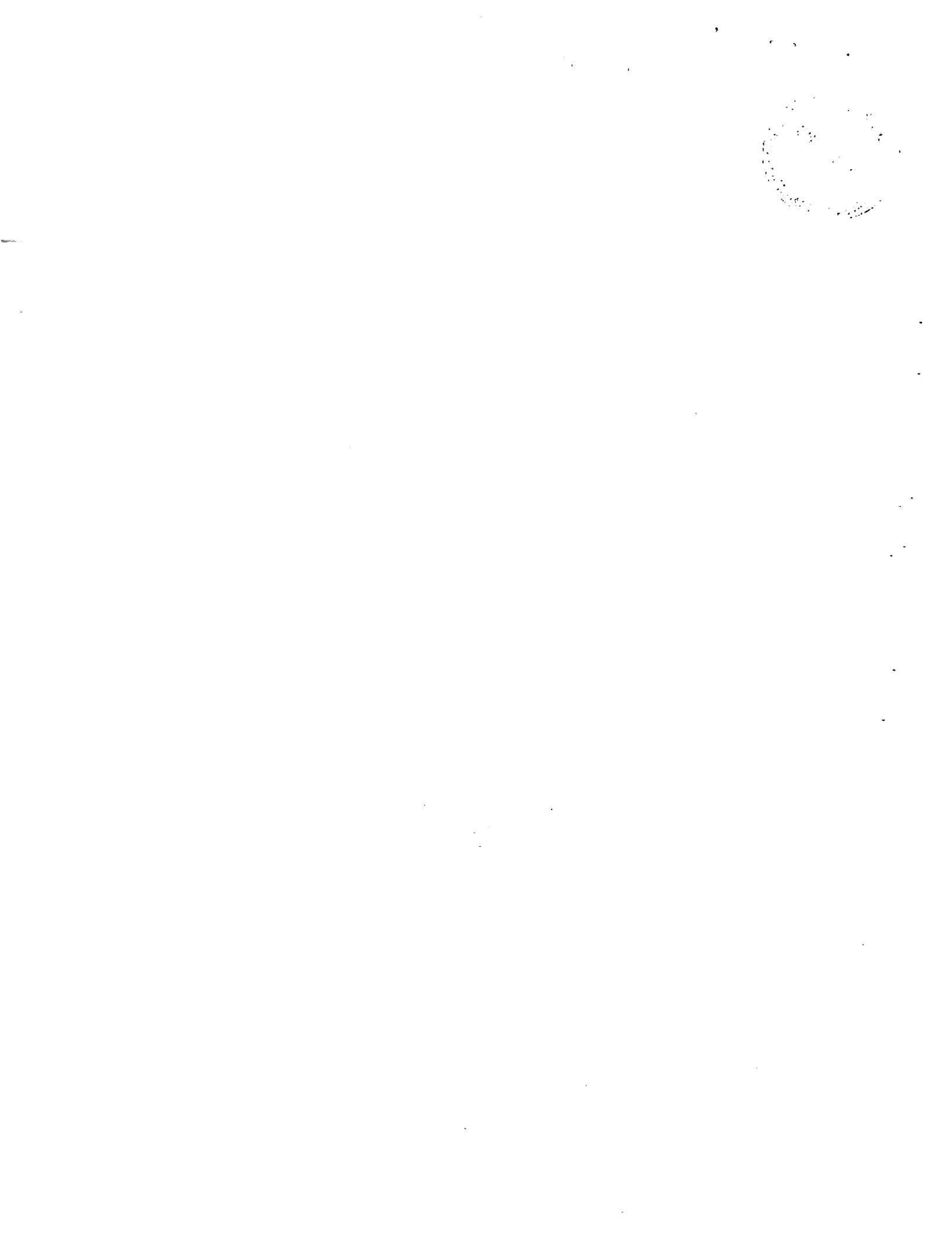
Respectfully submitted,

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Date: December 18, 2003  
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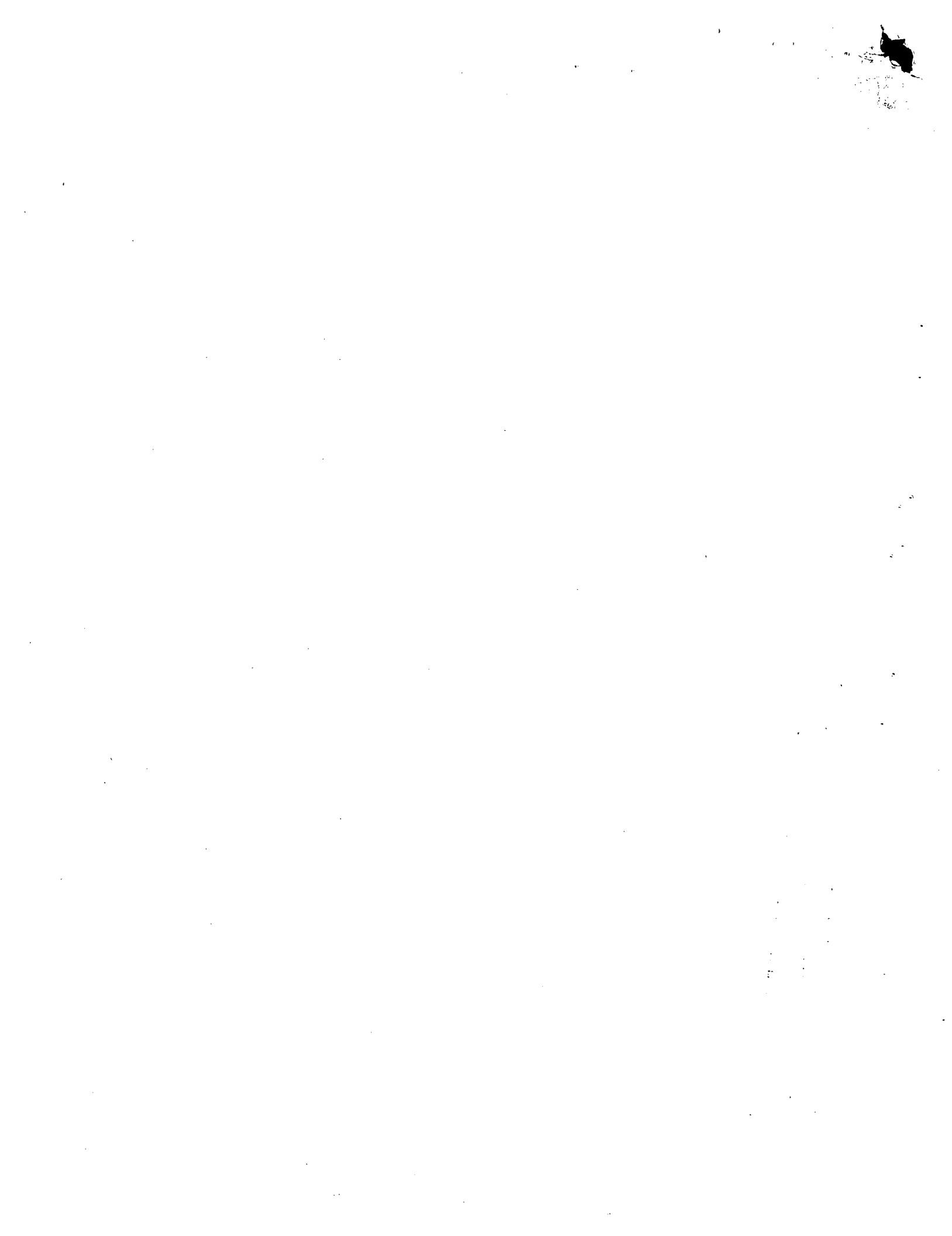
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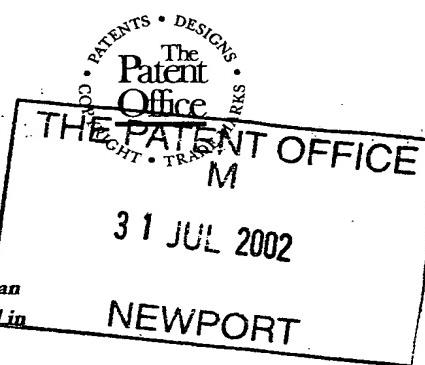
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01AUG02 E737726-1 D01463  
F01/7700 0.00-0217829.1

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**Request for grant of a patent**

*(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)*

1. Your reference 300200010-1 GB

2. Patent application number  
*(The Patent Office will fill in this part)* 31 JUL 2002

0217829.1

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*  
Hewlett-Packard Company  
3000 Hanover Street  
Palo Alto  
CA 94304, USA

Patents ADP number *(if you know it)*

496588001

If the applicant is a corporate body, give the country/state of its incorporation  
Delaware, USA

4. Title of the invention Allocation of Communications Frequency Spectrum

5. Name of your agent *(if you have one)*

Richard A. Lawrence  
Hewlett-Packard Ltd, IP Section  
Filton Road, Stoke Gifford  
Bristol BS34 8QZ

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

7448038001

Patents ADP number *(if you know it)*

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country Priority application number  
*(if you know it)* Date of filing  
*(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application Date of filing  
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

Yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))*

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Description

6

Claim(s)

3

CF

Abstract

1

Drawing(s)

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Priority documents

Translations of priority documents

1

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

1

Request for preliminary examination and search (Patents Form 9/77)

1

Request for substantive examination  
(Patents Form 10/77)

1

Any other documents  
(please specify)

Fee Sheet

11.

I/We request the grant of a patent on the basis of this application.

Signature

Richard A. Lawrence

Date

31/7/02

12. Name and daytime telephone number of person to contact in the United Kingdom

Meg Joyce Tel: 0117-312-9068

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# DUPLICATE

1

## Allocation of communications frequency spectrum

This invention relates to allocation of communications  
5 frequency spectrum. In particular aspects, it relates to  
a method of monitoring frequency availability across a  
communications frequency spectrum and to a system for  
achieving the same, such a method and system being  
extendable to to include re-utilising frequency  
10 availability.

The use of the radio spectrum for communications is  
typically controlled by governments and generally sold or  
licensed to various operators. The licences are generally  
15 static agreements, giving the operators the right to use  
different parts of the spectrum in different, specified,  
geographical areas. However, due to the geographical  
extent, the roll out of new base station infrastructure  
and the density of population some areas will not have the  
20 full spectrum in use at all times.

A problem arises in this respect because it is hard to re-  
use, re-sell or exploit the remaining spectrum, because it  
is unclear which parts are available at which times and in  
25 which geographical areas.

According to a first aspect of the present invention a  
method of monitoring frequency availability for a  
telecommunications network includes: establishing details  
30 of frequency spectrum usage in a database, said details to  
include one or more of time of use, frequency and  
geographic area of use; and providing query means for the

database, to allow the contents of the database to be queried.

The details of spectrum usage may additionally include one  
5 or more of ownership details of a particular part of the spectrum, licence-holder details of a particular part of the spectrum, planning rules relating to a particular part of the spectrum, a price or prices relating to a particular part of the spectrum. Said particular part of  
10 the spectrum may be a part by frequency, a part by geographic area and/or a part by time of use.

The database is preferably a relational database.

15 The database is preferably updated by means of a website interface. The database may be updated by editing a local copy of the file, preferably using the relational database program.

20 The query means may comprise a user interface, which preferably allows a user to enter search terms relating to frequency availability, said search terms may be the variables used in the details of spectrum usage. The query means is preferably operable to return details of  
25 spectrum availability based on the search terms entered.

The method of monitoring preferably extends to include a method of re-utilising frequency availability. The method preferably involves offering frequency availability for  
30 subsequent use.

The frequency availability may be resold, for example by auction. The database may be run and availability resold

by a party independent to one or more frequency owners/licence holders.

- The method may extend to enforcement of spectrum usage,  
5 whereby the use of resold frequency availability is monitored. The monitoring may be by means of frequency detectors, which may travel through chosen geographical areas to monitor frequency usage.
- 10 The details of spectrum usage may be entered as details of frequency in use (i.e. positive details) or as details of frequency not in use (i.e. negative details). In any event whether details of use or non-use are entered into the database frequency capacity can be determined.

15

According to a second aspect of the invention a system for monitoring frequency availability comprises a database containing details of frequency spectrum usage, including at least one of time of use, frequency and geographic area  
20 of use; and

database query means, operable to allow details of frequency spectrum usage to be entered and operable to return frequency availability for said entered details of frequency spectrum usage.

25

The system may also comprise available spectrum purchasing means, preferably operable to allow purchase, re-licensing or re-selling of available frequency spectrum.

30 The system may also comprise frequency usage monitoring means, which may incorporate at least one frequency usage detector.

The invention extends to a computer programmed to perform the method of the first aspect.

All of the features disclosed herein may be combined with  
5 any of the above aspects, in any combination.

For a better understanding of the invention and to show how the same may be brought into effect, a specific embodiment will now be described by way of example with  
10 reference to the accompanying drawings, in which:

Figure 1 is a schematic flow diagram showing the preparation and use of a dynamic database of spectrum usage and reuse of available frequencies; and

15

Figure 2 is a schematic diagram of a frequency monitoring system.

The way in which different parts of the radio spectrum for  
20 telecommunications use is partitioned between different operators and how that spectrum is used is not recorded in a searchable manner. Different geographical areas have different levels of use of different parts of the radio spectrum, because of differences in speed of rollout of  
25 base station infrastructure and because of the density of population and also population movements on daily timescales and on longer timescales. In view of this there is spectrum availability which at present is not managed or catalogued in any useful way.

30

A solution to the problem is to create a database of spectrum usage. The database is indexed by a variety of relevant variables, which may include a time period during

- which a particular part of the spectrum is in use, a particular geographical area in which a given part of the spectrum is in use, a frequency in use, details of the owner/licensee of the particular frequency and
- 5 geographical area, planning rules/regulations relating to a particular frequency or geographical area, prices for reuse of a particular part of the spectrum in a given area for a given time or for another specified variable.
- 10 An alternative formulation for the database would be to include information as when parts of the spectrum are not in use, rather than those parts which are in use as mentioned above.
- 15 The database is implemented using a relational database, which for example, may be an Oracle database.

Figure 1 shows a flow diagram of how the database may be built up and utilised. In box 10, data is entered into a  
20 database 18 (Figure 2) either to create new entries or to update existing entries via a data entry section 20 (see Figure 2) of a system for cataloguing the spectrum. The data entry means may be via a website, an e-service interface or by entry into a computer, on a local copy of  
25 the database file using the database computer program.

Means 22 (Figure 2) to query the database 18 are provided to allow querying at box 12 in Figure 1. The means 22 to query the database 18 may be a website in which particular  
30 locations or times can be entered to determine if there are any spare frequencies available. Results are returned (box 14) to the enquirer after comparison of the entered variables and values in the database 18.

A means 24 (Figure 2) to re-sell the spare spectrum is also included at box 16 in Figure 1. The re-selling may be achieved by means of an auction, possibly based on a  
5 website. The database 18 may be operated by an organisation that re-sells spectrum on behalf of licensors or on behalf of other parties who may own that part of the spectrum. The organisation may be government controlled or may be commercial such as a telecommunications service  
10 provider. A further alternative is to re-sell the spare spectrum by means of an electronic market place. Thus re-utilisation of the spare spectrum can be achieved by various methods.

15 In addition to the above, a means 26 to enforce spectrum usage may also be provided. For example, detector vans may be despatched to monitor usage of the spectrum with a view to preventing or deterring unauthorised use of parts of the radio spectrum.

20 The method and system described herein advantageously solve the problem of various parts of the spectrum in terms of frequency or geography or other variables being frequently unused to some extent. This unused spectrum  
25 can be catalogued by means of the method and system described herein and use can thereby be made of the spare spectrum by re-selling as described above.

Short-term uses for which frequency may be available  
30 include temporary events, outside broadcasts, meetings and conferences.

**CLAIMS:**

1. A method of monitoring frequency availability for a telecommunications network includes: establishing details 5 of frequency spectrum usage in a database, said details to include one or more of time of use, frequency and geographic area of use; and providing query means for the database, to allow the contents of the database to be queried.

10

2. A method as claimed in claim 1, in which the details of the spectrum usage additionally include one or more of ownership details of a particular part of the spectrum, licence-holder details of a particular part of the 15 spectrum, planning rules relating to a particular part of the spectrum, a price or prices relating to a particular part of the spectrum.

3. A method as claimed in claim 2, in which said 20 particular part of the spectrum is a part by frequency, a part by geographic area and/or a part by time of use.

4. A method as claimed in any preceding claim, in which the database is a relational database.

25

5. A method as claimed in any preceding claim, in which the database is updated by means of a website interface.

6. A method as claimed in any preceding claim, in which 30 the query means comprises a user interface, which is operable to allow a user to enter search terms relating to frequency availability.

7. A method as claimed in any preceding claim, in which the query means is operable to return details of spectrum availability based on the search terms entered.
- 5 8. A method as claimed in any preceding claim, which extends to include a method of re-utilising frequency availability.
9. A method as claimed in claim 8, in which the frequency 10 availability is resold.
10. A method as claimed in either claim 8 or claim 9, in which the database is run and availability resold by a party independent to one or more frequency owners/licence 15 holders.
11. A method as claimed in any preceding claim, which extends to a method of enforcing spectrum usage, whereby the use of resold frequency availability is monitored.
- 20 12. A method as claimed in any preceding claim, in which the details of spectrum usage are entered as details of frequency in use or as details of frequency not in use.
- 25 13. A system for monitoring frequency availability comprises a database containing details of frequency spectrum usage, including at least one of time of use, frequency and geographic area of use; and database query means, operable to allow details of 30 frequency spectrum usage to be entered and operable to return frequency availability for said entered details of frequency spectrum usage.

14. A system as claimed in claim 13, which also comprises available spectrum purchasing means.

15. A system as claimed in either claim 13 or claim 14,  
5 which also comprises frequency usage monitoring means.

16. A computer program to perform the method of any one of claims 1 to 12.

10 17. A method substantially as described herein with reference to the accompanying drawings.

18. A system substantially as described herein with reference to the accompanying drawings.

**ABSTRACT****Allocation of communications  
frequency spectrum**

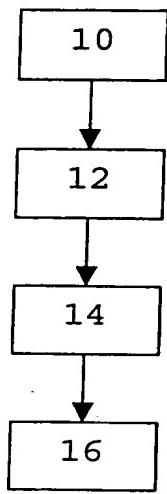
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A database is provided which gives details of telecommunications spectrum frequency usage. This database can be queried by users to determine whether there is frequency availability in, for example, 10 particular times, geographies or areas of the frequency spectrum. Such a database can be used with a mechanism for selling, or reselling, rights to use parts of the communications frequency spectrum.

15

[Figure 2]

**Figure 1**



**Figure 2**

